



Non-binary and binary transgender youth: Comparison of mental health, self-harm, suicidality, substance use and victimization experiences

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ABSTRACT

Background: Little research has compared the mental health and victimization experiences of non-binary youth depending on their sex assigned at birth (SAAB), or compared these two groups with binary transgender youth.

Aims: To compare mental health, self-harm and suicidality, substance use and victimization experiences between non-binary and binary transgender young adults, both male assigned at birth (MAAB) and female assigned at birth (FAAB).

Methods: Online survey data from 677 participants from the “Youth Chances” community study of 16 to 25 year olds in the United Kingdom was analyzed, comparing across binary participants (transgender females ($n = 105$) and transgender males ($n = 210$)) and non-binary participants (MAAB ($n = 93$) and FAAB ($n = 269$)).

Results: Female SAAB participants (binary and non-binary) were more likely to report a current mental health condition and history of self-harm than male SAAB participants (binary and non-binary). Similarly, female SAAB participants (binary and non-binary) were more likely to report childhood sexual abuse than male SAAB participants (binary and non-binary); the reverse pattern was found for lifetime physical assault relating to being LGBTQ. Non-binary MAAB participants were less likely than the other groups to report past suicide attempts and previous help-seeking for depression/anxiety. Binary participants reported lower life satisfaction than non-binary participants. For all four groups, mental health problems, self-harm, suicidality, alcohol use and victimization experiences were generally higher than that of youth in general population studies.

Conclusions: These findings highlight the importance of considering both non-binary versus binary gender identity and SAAB in relation to mental health problems, self-harm, suicidality and substance use in transgender youth. The roles of sexual abuse, other abuse and discrimination in contributing to increased rates of mental illness and self-harm in non-binary and binary transgender individuals, particularly those who were assigned female at birth, relative to those assigned male, require investigation.

KEYWORDS

Abuse; discrimination; gender identity; gender-nonconformity; genderqueer; mental illness

Introduction

Transgender is often used as an umbrella term to describe individuals whose gender identity and expression do not match their sex assigned at birth (SAAB) (Boza & Perry, 2014). This can include transgender males (people assigned female sex at birth, but who identify their gender as male) and transgender females (people assigned male sex at birth, but who identify their gender as female; Connolly, Zervos, Barone, Johnson, & Joseph, 2016). People who identify outside of the gender binary are often referred to as “non-binary”; these individuals may or may not also identify as transgender (Richards et al., 2016).

Non-binary gender identity can include identifying as neither male nor female, both male and female or as different genders at different times. The prevalence of non-binary gender identity has been reported as 1.8% in males and 4.1% in females (Van Caenegem et al., 2015). Within transgender populations, approximately 23%–36% identify as non-binary (McNeil, Bailey, Ellis, Morton, & Regan, 2012; Veale, Saewyc, Frohard-Dourlent, Dobson, & Clark, 2015).

Transgender youth have elevated rates of mental health difficulties (Connolly et al., 2016), including depression, anxiety, suicidality and self-harm (Clark et al., 2014) and substance abuse (Olson, Schragger,

Belzer, Simons, & Clark, 2015). Victimization, including verbal, physical and sexual abuse, is also more frequently reported in this population (Grossman, D'Augelli, & Frank, 2011). Minority stress theory suggests that victimization experiences may contribute to the elevated rates of mental health problems in transgender individuals (Hendricks & Testa, 2012), although the limited evidence from cross-sectional studies is conflicted regarding an association between transphobic victimization and mental health symptoms (e.g. Bouman, Davey, Meyer, Witcomb, & Arcelus, 2016; White Hughto, Pachankis, Willie, & Reisner, 2017).

Despite the increasing evidence of elevated mental health problems, self-harm, suicidality and substance use in transgender youth, little research has been undertaken comparing non-binary and binary transgender individuals. One exception is a study of young people aged 14–18 and 19–25 years by Veale, Watson, Peter and Saewyc (2017). They found that, in participants aged 14–18 years, non-binary participants felt more stressed and hopeless than transgender females. Furthermore, non-binary participants and transgender males had significantly higher levels of self-harm in the past year than the transgender females. In participants aged 19–25 years, non-binary participants reported worse mental health than transgender males and reported more self-harm in the past year than transgender females. Non-binary gender identity was also found to be associated with higher rates of substance use disorder treatment plus recent substance use relative to binary transgender identity (Keuroghlian, Reisner, White & Weiss, 2016). Warren, Smalley and Barefoot (2016) reported mental health differences between transgender adults and sexual minority adults that were different to those between non-binary participants and sexual minority adults. However, they did not compare the transgender groups against each other directly.

Although the above studies found differences between binary and non-binary participants, non-binary participants were not separated by SAAB. General population studies consistently find that females have a higher prevalence of depression and anxiety, self-harm, mental health treatment-seeking and suicidal ideation than males (McManus, Bebbington, Jenkins, & Brugha, 2016). Females are also at greater risk of childhood sexual abuse (Office for National Statistics (ONS), 2016). Conversely, males report

more experiences of physical assault and substance abuse than females (NHS Digital, 2017; ONS, 2016). Research comparing transgender males and females suggests mental health and victimization may be more strongly associated with SAAB than current gender identity (Millet, Longworth, & Arcelus, 2017). For example, transgender males report higher anxiety (Bouman et al., 2017), suicidal ideation (Richards et al., 2016), self-harm (Arcelus, Claes, Witcomb, Marshall, & Bouman, 2016) and sexual abuse (Holt, Skagberg, & Dunsford, 2016) than transgender females. Therefore, it may be important to consider SAAB when investigating such problems in non-binary individuals.

Sterzing, Ratliff, Gartner, McGeough and Johnson's (2017) study, assessing victimization experiences in binary and non-binary transgender youth (aged 14–19 years), did investigate non-binary participants separately depending on their SAAB. For the non-binary participants, they found some differences depending on SAAB. For example, relative to sexual minorities, only non-binary male assigned at birth (MAAB) participants reported higher rates of physical assault related to their minority status, whereas only non-binary female assigned at birth (FAAB) participants were significantly more likely to report child maltreatment. However, gender minority groups were not directly compared and the study was underpowered to detect significant differences for transgender females.

No previous studies could be identified by the authors that directly compared the four groups of transgender youth (transgender men, transgender women, non-binary FAAB and non-binary MAAB) across measures of mental health, self-harm and suicidality, substance use and victimization. This study aimed to begin addressing this gap by analyzing secondary data from the "Youth Chances" study in the United Kingdom (UK). Analyses are predominantly exploratory, due to limited previous research in this area and inconsistent findings. However, some priori hypotheses were identified. Drawing on general population and binary transgender research, it was predicted that female SAAB participants (binary and non-binary) would be more likely to report childhood sexual abuse, mental health problems and lifetime self-harm than male SAAB participants (binary and non-binary). It was also predicted that male SAAB would report more physical assault, in line with general population findings (18% vs. 4%; ONS, 2016).

Drawing on transgender studies, it was hypothesized that non-binary participants would report higher levels of self-harm and mental health problems than binary participants (Veale et al., 2017) and non-binary MAAB participants would report higher rates of physical assault than female SAAB participants (Sterzing et al., 2017).

Methods

Participants and procedure

This study involved the analysis of secondary data from the “Youth Chances” project, which was funded by the UK Big Lottery. The project investigated the needs of LGBTQ (Lesbian, Gay, Bisexual, Transgender or Questioning) young adults (aged 16–25 years) in the UK. Participants were recruited through LGBT and youth organizations, social media, advertisements in the LGBT press, at Gay Pride events and through snowball sampling. Data was collected online between May 2012 and April 2013. Prior to participation, respondents gave informed consent. At the end of the survey, and after sensitive questions, participants were signposted to resources offering further support. The project was approved by the University of Greenwich Research and Ethics Committee and analysis of secondary data reported in the current study received approval from King’s College London (ref. PNM/14/15–50).

Participants were 677 gender minority young adults with mean age of 19.9 years (SD 2.7). They were identified for inclusion in the current study through their responses to the questions “What gender were you assigned at birth?” with options “male, female, intersex, prefer not to say” and “Which of the following describes how you think of yourself now?” with options “Male, Female, in another way.” Intersex participants were excluded. Participants were included if their current gender identity was different to their SAAB. Participants were categorized into four gender minority subgroups: Transgender female (TF; $n = 105$, 15.5%) participants were those whose SAAB was male and current gender identity was female. Transgender males (TM; $n = 210$, 31%) participants were those whose SAAB was female and whose current gender identity was male. Non-binary MAAB ($n = 93$, 13.7%) participants were MAAB and identified “in another way” to the question about gender identity. Non-binary-FAAB ($n = 269$, 39.7%) were FAAB and

responded “in another way” to the question about gender identity. The sociodemographic characteristics of the four groups are shown in Table 1.

Measures

Sociodemographic characteristics and sexual orientation

Sociodemographic characteristics were assessed with questions regarding ethnicity, social class and education qualifications. Responses to the question “What is your ethnic group?” were recoded into “White,” “Mixed,” “Asian,” “Black” and “any other ethnic background.” Responses to the question “How would you describe your social class now?” with options “Working Class, Middle Class, Upper class, I don’t know, Other” were recoded into working class versus middle or upper class. “I don’t know” or “Other” responses were excluded. Responses to the question “What is your highest educational qualification that you have completed so far?” were recoded into “none,” “exams taken at 16: GCSE/NVQ/BTEC level1–2,” “exams taken at 18: A-Level/AS/BTEC level3/ International Baccalaureate” and “higher education: HNC/ HND/ Foundation/ Bachelor/ Masters/ Doctoral Degree.”

Sexual orientation and attractions were assessed with the question “Do you consider yourself to be: Heterosexual or straight, Gay or Lesbian, Bisexual, Not Sure-Questioning, something else” and “Thinking about your feelings of attraction to other people, which best describes your feelings? Are you only attracted to females, mostly attracted to females, equally attracted to females and males, only attracted to males, mostly attracted to males, not attracted to males or females, not sure, something else.”

Mental health, self-harm and suicidality

Life Satisfaction was assessed with the Satisfaction with Life Scale (SLS), a five-item questionnaire giving a score of 5–35 (Diener, Emmons, Larsen, & Griffin, 1985). Questions include “I am satisfied with life” and “The conditions of my life are excellent.” Higher scores indicate higher life satisfaction. Cronbach’s alpha was 0.89.

To assess participants’ mental health and help-seeking behavior, participants were asked the questions “Do you have any mental health conditions or illnesses lasting or expected to last 12 months or more”;

Table 1. Sociodemographic characteristics and sexual orientation across gender identification categories.

	Transgender female <i>n</i> (%)	Transgender male <i>n</i> (%)	Non-binary MAAB ^d <i>n</i> (%)	Non-binary FAAB ^d <i>n</i> (%)	Result of group comparison
Age in years (Mean, SD)	20.2 (2.5)	19.7 (2.7)	20.1 (2.7)	19.9 (2.8)	$F(3,356) = 0.50, p = 0.679$
Ethnicity ^e					$\chi^2(3) = 5.21, p = 0.157$
White	75 (97.4%)	128 (92.8%)	63 (91.3%)	182 (89.2%)	
Mixed	1 (1.3%)	6 (4.3%)	4 (5.8%)	15 (7.4%)	
Asian	0 (0%)	3 (2.2%)	1 (1.4%)	1 (0.5%)	
Black	1 (1.3%)	0 (0%)	0 (0%)	3 (1.5%)	
Other	0 (0%)	1 (0.7%)	1 (1.4%)	3 (1.5%)	
Social class					$\chi^2(3) = 2.87, p = 0.413$
Working	28 (41.8%)	50 (45.5%)	22 (37.3%)	65 (35.9%)	
Middle/upper	39 (58.2%)	60 (54.5%)	37 (62.7%)	116 (64.1%)	
Highest educational qualification					$\chi^2(9) = 6.92, p = 0.645$
None	2 (2.6%)	3 (2.2%)	2 (2.9%)	7 (3.4%)	
GCSE (16 years)	22 (28.6%)	37 (27.2%)	15 (22.1%)	44 (21.7%)	
A-Level (18 years)	38 (49.4%)	69 (50.7%)	34 (50%)	92 (45.3%)	
Higher education	15 (19.5%)	27 (19.9%)	17 (25%)	60 (29.6%)	
Sexual orientation					$\chi^2(12) = 84.67, p < 0.001^*$
Heterosexual	10 (10.3%) ^{ab}	33 (17.1%) ^a	6 (6.7%) ^b	6 (2.3%)	
Lesbian or gay	21 (21.6%) ^a	39 (20.2%) ^a	32 (36%)	61 (23.6%) ^a	
Bisexual	25 (25.8%) ^a	46 (23.8%) ^a	22 (24.7%) ^a	35 (13.6%)	
Unsure/questioning	11 (11.3%) ^{ab}	26 (13.5%) ^a	4 (4.5%) ^b	15 (5.8%) ^b	
Something else	30 (30.9%) ^a	49 (25.4%) ^a	25 (28.1%) ^a	141 (54.7%)	
Feelings of Attraction ^e					$\chi^2(18) = 112.90, p < 0.001^*$
Only females	12 (12.4%) ^a	25 (13%) ^a	7 (8.0%) ^a	41 (16.0%) ^a	
Mostly females	35 (36.1%) ^a	40 (20.8%) ^d	14 (15.9%) ^b	79 (30.7%) ^a	
Equally m/f	12 (12.4%) ^a	30 (15.6%) ^a	9 (10.2%) ^a	32 (12.5%) ^a	
Only males	4 (4.1%) ^a	10 (5.2%) ^a	22 (25.0%) ^a	5 (1.9%) ^a	
Mostly males	11 (11.3%) ^a	45 (23.4%) ^b	20 (22.7%) ^b	15 (5.8%) ^a	
Asexual	2 (2.1%) ^a	3 (1.6%) ^a	1 (1.1%) ^a	11 (4.3%) ^a	
Unsure	5 (5.2%)	11 (5.7%)	4 (4.5%)	6 (2.3%)	
Something else	16 (16.5%) ^a	28 (14.6%) ^a	11 (12.5%) ^a	68 (26.5%)	

*Indicates a significant difference.

^{a,b,c}Values sharing a superscript do not differ significantly.

^dMAAB = male assigned at birth; FAAB = female assigned at birth.

^eFor ethnicity, to allow sufficient cell size for the chi-square analysis, responses were recoded into "White" and "Black and Minority Ethnic (BME)" which was the other four categories combined.

"Do you have any health conditions or illnesses which affect you and interfere with your normal activities" (with mental health condition as one of the response options) and "Have you ever gone for medical help for depression or anxiety?", with yes/no options. Participants' experiences of self-harm were assessed with the question "Have you ever hurt yourself on purpose? This is sometimes called 'self-harm'." Participants' suicidality was assessed with three items from the Suicide Behaviors Questionnaire-Revised (SBQ-R) (Osman et al., 2001), which assessed lifetime experience of suicidal ideation, past year suicidal ideation and future likelihood of suicide. For the latter, options "no chances at all, rather unlikely, unlikely, likely, rather likely and very likely" were recoded to no chances at all and unlikely versus likely.

Substance abuse

To assess substance abuse, participants were asked questions regarding smoking, drugs and alcohol. Responses

to the question "Do you now smoke daily, occasionally or not at all?" were recoded to daily smoking or not. Participants were asked "Do you take the following drugs, and if so, how often?" with options "never, a few times a year, less than monthly, monthly, weekly, daily" about the following (with alternative names provided): marijuana, amphetamines, cocaine, ecstasy, inhalants, sedatives, hallucinogens, heroin, GHB/GBL, a prescription drug use recreationally, another illegal drug," and were recoded into "at least weekly" versus "less than weekly" use of any drug. Alcohol use was assessed with the AUDIT-C questionnaire, giving a score of 0–12 (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998). Higher scores indicate unsafe drinking. Cronbach's alpha for this sample was 0.72.

Abuse and victimization

To assess lifetime abuse/violence, not including sexual abuse, participants were asked "Have you ever experienced abuse or violence from someone close to you?"

Abuse and violence was described as “This is sometimes called ‘domestic violence’: any incident of threatening behaviour, violence or abuse between... partners, friends or family members. This could take a number of different forms: psychological, physical, financial, emotional. This also includes honour-based violence and forced marriage.” To assess sexual abuse, participants were asked “Have you ever experienced sexual abuse?” with options “no, yes – when I was under 16, yes – when I was over 16.” Responses were recoded into two variables; sexual abuse below 16 years and lifetime sexual abuse.

To assess victimization, participants were asked the question “Have you ever experienced any of the following because you are LGBTQ or people thought you were LGBTQ in public?”: “being outed as trans or questioning; name calling/verbal abuse; threat/intimidation; blackmail; theft; damage to property and physical assault” with options “once, more than once, often, never.” Responses were recoded to indicate lifetime experiences. In addition, participants were asked “Have you ever had to leave your home because felt unsafe or felt you had not choice?”; and if so, “Was this anything to do with sexuality and gender identity?”; “not at all/it was part of the reason/it was the reason.” The two questions were combined to indicate whether participants have ever left home because they felt unsafe/had no choice due to sexuality or gender identity.

Statistical analysis

Statistical analysis was conducted using SPSS v.23.0 (IBM, 2015). Group differences were investigated using one-way ANOVA and chi-square analyses. An alpha level of 0.05 was used. Significant group effects were followed up by pairwise comparisons (*t*-tests or chi-square analyses). The *p* value was not adjusted because this was a preliminary study aimed at identifying possible differences between the four groups; it was considered important not to increase the chance of Type II errors.

Results

Full results of the group comparisons are shown in Tables 1–3. The main results are also summarized below.

Sociodemographic characteristics

There were no significant group differences for age, ethnicity, social class and education qualifications (see Table 1). There were significant group differences in

both sexuality measures. Regarding sexual orientation, non-binary FAAB were significantly less likely to be heterosexual or bisexual than all other groups and more likely to endorse the “something else” response. Non-binary MAAB were less likely to be heterosexual than TM, and were more likely to be gay/lesbian than other groups. Non-binary FAAB and non-binary MAAB were less likely to be unsure/questioning than TM, who did not differ from TF on that response.

For sexual attractions, TM and non-binary MAAB were less likely to be attracted to “mostly females” and more likely to be attracted to “mostly males” than TF or non-binary FAAB. Non-binary MAAB were more likely to report “only male” attractions than other groups. Non-binary FAAB were more likely to report their attractions as “something else” than other groups.

Mental health, self-harm, suicidality and substance abuse

Participants who had been assigned female a birth (TM and non-binary FAAB) were significantly more likely than those assigned male at birth (TF and non-binary MAAB) to report a mental health condition that interferes with daily activities. There was a similar pattern for lifetime self-harm. Future suicide was also rated as likely in a higher proportion of those assigned female at birth as those assigned male, although the proportion of TM group (27%) was not significantly higher than the TF group (16%). Non-binary MAAB participants were less likely to have ever attempted suicide or sought help for depression/anxiety than the other three groups. There was no significant group difference in suicidal ideation over the past year.

Compared to the mental health results, life satisfaction showed a different pattern of group differences, with binary transgender participants (TF and TM) having significantly lower ratings of life satisfaction than non-binary participants (MAAB and FAAB). No significant group differences in smoking, weekly drug use, and alcohol consumption emerged (See Table 2).

Abuse and victimization experiences

Childhood sexual abuse was reported by a significantly greater proportion of participants who had been assigned female a birth (TM and non-binary FAAB) than those assigned male at birth (TF and non-binary MAAB); see Table 3. Although the patterns of proportions were

Table 2. Mental health, self-harm, suicidality and substance abuse across gender identification categories.

	Transgender female <i>n</i> (%)	Transgender male <i>n</i> (%)	Non-binary MAAB ^d <i>n</i> (%)	Non-binary FAAB ^d <i>n</i> (%)	Result of group comparison
Mental health					
condition interfering with daily activities	21 (27.6%) ^a	60 (43.8%) ^b	15 (21.7%) ^a	98 (47.8%) ^b	$\chi^2(3) = 20.40, p < 0.001^*$
Ever sought medical help for depression or anxiety	44 (55%) ^a	85 (59.9%) ^a	20 (28.6%)	131 (63%) ^a	$\chi^2(3) = 26.38, p < 0.001^*$
Self-harm and suicidality					
Self-harm ever	50 (62.5%) ^a	112 (78.9%) ^b	34 (48.6%) ^a	168(80.8%) ^b	$\chi^2(3) = 34.35, p < 0.001^*$
Past suicide attempt	24 (30%) ^a	46 (32.2%) ^a	8 (11.6%)	50 (24.3%) ^a	$\chi^2(3) = 11.32, p = 0.010^*$
Past year suicide ideation	58 (72.5%)	108 (75.5%)	44 (63.8%)	146 (71.2%)	$\chi^2(3) = 3.21, p = 0.360$
Future suicide likely	13 (16.3%) ^{ac}	39 (27.3%) ^{ac}	7 (10.1%) ^b	65 (31.6%) ^c	$\chi^2(3) = 16.54, p < 0.001^*$
Life satisfaction (Mean, SD)	15.8 (7.2) ^a	17.0 (7.8) ^a	19.4 (6.6) ^b	19.1 (7.8) ^b	$F(3, 480) = 4.93, p = 0.002^*$
Smoke daily	7 (23.3%)	27 (31%)	6 (18.2%)	25 (23.4%)	$\chi^2(3) = 2.67, p = 0.445$
Weekly drug use	5 (6.3%)	12 (8.4%)	6 (8.7%)	7 (3.4%)	–
Alcohol use – AUDIT (Mean, SD)	5.1 (2.6)	4.3 (2.4)	5.2 (2.8)	4.9 (2.5)	$F(3,413) = 2.43, p = 0.065$

^aIndicates a significant difference < 0.05 .

^{ab}Values sharing a superscript do not differ significantly.

AUDIT – Alcohol Use Disorders Identification Test.

^dMAAB = male assigned at birth; FAAB = female assigned at birth.

“–” indicates inadequate cell size to use chi-square analysis.

similar for lifetime sexual abuse, the proportion in the TF group (18%) was not significantly lower than in the TM group (26%). Domestic abuse or violence was reported by significantly more non-binary FAAB than those assigned male at birth (TF and non-binary MAAB); they did not differ significantly from TM. TF were in an intermediate position, with a proportion reporting domestic abuse/violence that did not differ significantly from the TM or non-binary MAAB groups.

With regards to LGBTQ victimization, the most common experience was verbal abuse, but this did not differ significantly across the groups (76–84%). Non-binary FAAB participants were less likely to have experienced LGBTQ-related threat/intimidation than the other three groups, although half of this group had experienced it. Non-binary MAAB participants were more likely to have experienced LGTBQ-related damage to property than the other three groups. Those assigned male at birth (TF and non-binary MAAB) were more likely to have experienced LGBTQ-related physical assault than those assigned female at birth (TM and non-binary FAAB). Blackmail was reported by over a fifth of TM and non-binary MAAB participants. There were no significant group differences for theft.

Discussion

As far as the authors are aware, this is the first study to compare mental health, substance use and victimization experiences between four gender minority subgroups – transgender male, transgender female, non-binary

MAAB and non-binary FAAB youth. The key findings will be discussed briefly below. As this was a cross-sectional, preliminary study, speculation about the reasons for the group differences has been kept to a minimum.

Mental health and life satisfaction

As predicted, female SAAB participants were more likely than male SAAB participants to report a current mental health problem. This is consistent with previous research reporting higher levels of mental illness in transgender males than transgender females (Millet et al., 2017) and higher levels of depression and anxiety in females than males in general population studies (20.7% vs. 13.2%; McManus et al., 2016). Contrary to the prediction based on Veale et al.’s (2017) study, there was no evidence that non-binary participants had higher rates of mental illness than binary participants, however that study combined non-binary male and female SAAB participants. The current findings highlight the importance of considering SAAB when investigating mental health in both non-binary and binary transgender youth. Further research is now needed to investigate specifically which mental health problems differ between these four gender minority groups.

Rates of a current mental health problem that interferes with daily activities were higher in all groups than the general population (18.8%; ONS, 2015), in line with previous findings (e.g., Connolly et al., 2016). Similarly, life satisfaction ratings in all four groups were considerably lower than those in general

Table 3. Abuse and victimization experiences across gender identification categories.

	Transgender female <i>n</i> (%)	Transgender male <i>n</i> (%)	Non-binary MAAB ^d <i>n</i> (%)	Non-binary FAAB ^d <i>n</i> (%)	Result of group comparison
Sexual abuse <16 years	7 (9%) ^a	30 (21.1%) ^b	6 (8.7%) ^a	50 (24.3%) ^b	$\chi^2(3) = 14.10, p = .003^*$
Sexual abuse lifetime	14 (17.9%) ^a	37 (26.1%) ^{ab}	10 (14.5%) ^a	69 (33.5%) ^b	$\chi^2(3) = 13.29, p = 0.004^*$
Other abuse or violence from someone close-lifetime	28 (32.6%) ^{ab}	72 (43.4%) ^{ac}	20 (24.7%) ^b	100 (45.7%) ^c	$\chi^2(3) = 13.62, p = 0.003^*$
Left home due to sexuality or gender identity	21 (26.3%)	44 (30.3%)	15 (22.1%)	40 (23.1%)	$\chi^2(3) = 2.72, p = 0.437$
LGBTQ victimization (lifetime)					
Verbal abuse	75 (84.3%)	137 (81.5%)	67 (82.7%)	170 (75.9%)	$\chi^2(3) = 3.98, p = 0.264$
Threat/intimidation	57 (64%) ^a	101 (60.5%) ^a	52 (64.2%) ^a	112 (50%)	$\chi^2(3) = 8.80, p = 0.032^*$
Physical assault	39 (43.8%) ^a	45 (26.9%) ^b	38 (46.9%) ^a	62 (27.7%) ^b	$\chi^2(3) = 17.49, p = 0.001^*$
Theft	13 (14.6%)	23 (13.7%)	14 (17.3%)	25 (11.2%)	$\chi^2(3) = 2.15, p = 0.542$
Blackmail	11 (12.5%) ^a	38 (22.6%) ^b	17 (21%) ^{bc}	28 (12.5%) ^{ac}	$\chi^2(3) = 9.23, p = 0.026^*$
Damage to property	8 (9%) ^a	30 (17.9%) ^a	25 (30.9%)	35 (15.6%) ^a	$\chi^2(3) = 15.09, p = 0.002^*$

*Indicates a significant difference.

^{a,b}Values sharing a superscript do not differ significantly.

^dMAAB = male assigned at birth; FAAB = female assigned at birth.

population studies (mean score of 25; Diener et al., 1985). In contrast to the pattern of findings for mental illness, non-binary participants reported higher levels of life satisfaction than binary participants. Reasons for greater dissatisfaction in binary than non-binary participants need further investigation. For example, this may relate to issues around access or experience of medical interventions.

Self-harm

As predicted, female SAAB participants (binary and non-binary) reported higher rates of lifetime self-harm than male SAAB participants (binary and non-binary). This corresponds with higher rates of reported self-harm in females than males in general population studies (8.9% vs. 5.7%; McManus et al., 2016) and supporting research suggesting male transgender individuals have a higher rate of self-harm than female transgender individuals (Arcelus et al., 2016; Veale, Watson, Peter, & Saewyc, 2017). There was no evidence to support the prediction that non-binary participants would report more self-harm than binary participants, which had been based on a sample of combined male and female non-binary participants (Veale et al., 2017). The proportions of participants reporting lifetime self-harm are much higher in the current study (49%–81%) than in the general population, consistent with previous studies (Clark et al., 2014).

Suicidality

Non-binary MAAB participants reported lower rates of past suicide attempts than non-binary-FAAB and

binary participants. Suicidal ideation over the past year did not differ significantly across the groups, but was high in all (64%–76%). Future suicide risk was highest in non-binary MAAB participants (32% rated it as likely) and transgender males (27%), although the latter group did not differ significantly from transgender females (16%). This pattern is consistent with previous transgender research (Richards et al., 2016) and higher rates of suicidal ideation in females in general population studies (McManus et al., 2016). High ratings across all suicide measures indicate the importance of suicide risk assessment in both non-binary and binary transgender groups, particularly those who were female SAAB.

Substance abuse

No group differences were found in daily smoking, weekly drug use and alcohol use. This contrasts to a U.S. study of transgender participants which reported that that male to female spectrum gender identity was associated with higher risk of substance use disorder treatment plus recent substance use, relative to female to male spectrum gender identity, and that non-binary gender identity was associated with higher rates than binary transgender identity (Keuroghlian, Reisner, White, & Weiss, 2015). That study was conducted in Canada rather than the UK so may reflect cultural influences but this requires further investigation. In the current study, the mean scores for male SAAB participants were higher than the cut-off indicating hazardous drinking or alcohol use disorders for males in the general population (≥ 4), and female SAAB

participants scored greater than the cut-off point for females in the general population (≥ 3) (Bradley et al., 2007). This is consistent with a previous study which found that transgender individuals reported heavy episodic drinking on more days than non-transgender participants (Coulter et al., 2015), but the present study adds to our understanding by investigating non-binary participants and by comparing participants on the basis of their SAAB. Recent discrimination and sex work were associated with higher rates of substance use disorder treatment plus recent substance use in Keuroghlian et al.'s (2016) study of transgender individuals. Alcohol misuse prevention and intervention programs should take into account the increased risk for non-binary and transgender individuals and the factors that may contribute to this.

Abuse and violence

As predicted, female SAAB participants (binary and non-binary) were more likely to report experiencing sexual abuse below the age of 16 than male SAAB participants. This is consistent with findings in the general population that girls are more likely than boys to experience childhood sexual abuse (11% vs. 3%; ONS, 2016) and previous research finding higher rates of sexual abuse in transgender males than transgender females (Holt et al., 2016). As childhood sexual abuse is known to mediate mental health problems (Spataro, Mullen, Burgess, Wells, & Moss, 2004), this higher rate in female SAAB participants may explain why these individuals had greater rates of mental illness. Similarly, for lifetime sexual abuse and domestic abuse/violence, overall the highest proportions were reported in female SAAB participants and the lowest in the male SAAB participants. Some of these group differences were not statistically significant, but this may have been a power issue relating to sample size; further research is required with larger samples.

Furthermore, it is important to note that rates of childhood sexual abuse in this study were notably higher in all groups (26%–34% for FAAB and 15%–18% for MAAB) than in the general population (4.8%; Saied-Tessier, 2014). The current findings are consistent with previous reports of higher rates of sexual abuse and domestic violence in binary transgender individuals than in the general population (e.g., Stotzer, 2009), but the present study extends this to non-binary youth. A general population study found

that the relationship between gender nonconformity during childhood and depressive symptoms in early adulthood was partly mediated by caregiver abuse (Roberts, Rosaria, Slopen, Calzo, & Austin, 2013). The relationship between childhood gender conformity and gender identity, child abuse and psychological problems requires investigation in gender minority samples, including non-binary individuals. Child abuse prevention programs and those supporting children and adolescents should also take into account that both non-binary and transgender individuals, especially those assigned female at birth, may be at particularly high risk for abuse.

LGBTQ victimization

As predicted, male SAAB participants (binary and non-binary) were more likely to report LGBTQ-related physical assault than female SAAB participants (binary and non-binary). This corresponds to general population findings that males are more likely than females to experience physical assault (ONS, 2016). Similarly, non-binary FAAB participants were less likely to experience threat/intimidation than any other group. As the male SAAB participants experienced the highest level of LGBTQ-related physical assault but lowest rates of mental health problems, this suggests that such physical assault experiences do not underlie the differences between these four groups in mental health problems. This is consistent with Bouman et al.'s (2016) finding that transphobic physical victimization was not correlated with depressive symptoms.

It should be noted that rates of heterosexual orientation were low in all groups (maximum 17%) and particularly rare in non-binary FAAB participants (2%). These heterosexuality rates are lower than some previous studies in transgender individuals (Factor & Rothblum, 2008). Almost all participants will have been at risk of experiencing stigma and discrimination relating both to their minority sexual orientation as well as their gender identity; this may contribute to the elevated rates of mental health problems and reduced life satisfaction in these participants. This study only assessed victimization; there are other ways in which LGBTQ stigma and discrimination could impact on mental health, such as internalization of stigma and the effects on self-acceptance, self-esteem

and expectations of rejection (Hendricks & Testa, 2012; Meyer, 2003), which requires investigation across the four groups.

Limitations

As there has been little research comparing gender minority subgroups, the aim was to identify possible group differences across a variety of outcomes that could be investigated further in subsequent research. Therefore, the analyses did not adjust for multiple comparisons, to reduce the chance of Type II errors. Group differences identified now require further investigation. Additionally, due to the cross-sectional design, causal inferences between victimization and poor mental health cannot be made.

As is common in this field of research, the sample was collected online and through targeted/snowball sampling. It cannot be assumed that participants are representative of transgender and non-binary youth in the UK. Furthermore, although no variation by ethnicity was found across the groups, most participants were white. It cannot be assumed that results would generalize to other ethnic groups. As ethnic minority individuals are subject to further discrimination, they may be at risk to even higher adverse mental health outcomes than transgender people from majority ethnic groups (Xavier, Bobbin, Singer, & Budd, 2005). Further, the data were collected between 2012 and 2013. If the study were repeated, findings may differ as the number of individuals identifying as transgender is increasing (Zucker & Wood, 2016). Although this study used a relatively large sample size of transgender youth ($n = 677$), there were some analyses that may have been underpowered to detect group differences (e.g., lifetime sexual abuse). Future research should aim to recruit larger sample sizes.

The study did not ask about specific mental health conditions and relied on self-report regarding a mental health condition rather than objective clinical assessment. However, it is unlikely that any self-report bias would act differentially across the four groups. These findings highlight the need for further research into which mental health diagnoses differ between the groups, using validated clinical assessments.

The transgender and non-binary gender identity categories used here do not necessarily match the terms preferred by the participants. Future research should identify a universal method of identifying non-

binary gender identity with increased sensitivity and specificity, to enable comparisons across research studies to be made. Furthermore, the survey did not address “transitioning” status or types (Veale et al., 2017). For example, it is unknown what percentage of the sample were receiving cross-sex hormone therapy and research shows that hormone therapy can be associated with a reduction of mental health problems (Costa & Colizzi, 2016).

Clinical and research implications

The high rates of mental health problems, self-harm, suicidality and alcohol use in all groups are consistent with previous studies indicating greater need for mental health interventions in transgender youth. Overall, female SAAB participants, whether binary or non-binary, had the greatest need for mental health support. One possible contributory factor is the higher level of sexual abuse in the female SAAB participants, and there was a similar trend regarding domestic violence. In addition, the female SAAB participants are likely to have experienced the greatest level of lifetime exposure to discrimination relating to female gender. The impact of abuse and discrimination on the mental health of gender minorities requires further investigation. Mental health professionals should assess for child abuse and other trauma in all gender minority youth seeking help and provide trauma-focused interventions when required. Young people may also require support for coping with ongoing victimization experiences relating to their gender or sexual identity. Societal-level interventions addressing stigma and discrimination based on gender and gender identity are also needed.

Conclusions

There were differences in mental health, self-harm, suicidality and victimization between binary and non-binary participants, and between those who are male or female SAAB. Non-binary MAAB participants generally had the lowest degree of psychological problems and female SAAB (both binary and non-binary) had the highest. The pattern of group differences in mental health and self-harm/suicidality were generally similar to the patterns of group differences in sexual abuse and domestic abuse/violence. The roles of sexual abuse, domestic abuse/violence and gender-based discrimination in contributing to elevated rates of mental

health problems and self-harm/suicidality in female SAAB gender minority individuals require further investigation. This information is needed to improve mental health prevention and treatment strategies for gender minority individuals.

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Declaration of conflict of interest/ethical approval

The authors declare that they have no conflict of interest. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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